REMARKS

Claims 1-34 are pending in this application, claims 1, 9 and 20 being the independent claims.

Claims 1-3, 4-8, 9-11, 12-13, 14-15, 16-17, 18-19, 20-23, 24-29 and 31-34 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the claims in U.S. Appl. Serial No. 10/313,965. It is respectfully requested that the issue regarding the need for a Terminal Disclaimer in this matter be held in abeyance, pending resolution of the other patentability issues herein.

Claims 1-34 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Srikant, U.S. Patent Appl. Serial No. 2003/00308991 in view of Dennis, U.S. Patent No. 6,633,712. This rejection is hereby traversed for at least the following reasons.

As set forth in claim 1, an optical communication system that includes a transmitting terminal, a receiving terminal, and an optical transmission path optically coupling the transmitting and receiving terminals and having at least one rare-earth doped optical amplifier therein, a second optical amplifier is provided The second optical amplifier includes a first portion of the optical transmission path having a first end coupled to the transmitting terminal and a second end coupled to a first of the rare-earth doped optical amplifiers. In addition, the second optical amplifier includes a pump source providing pump energy to the first portion of the optical transmission path at one or more wavelengths that is less than a signal wavelength to provide Raman gain in the first portion at the signal wavelength. After an increase in optical loss in the first portion of the optical transmission path arising from performance of a cable repair thereto, the Raman gain supplied to the optical signal is increased to overcome at least a portion of the increase in optical loss.

Srikant shows in FIG. 1 an amplifier site 10 that includes a distributed Raman amplifier 20 coupled to an erbium doped fiber preamplifier 30, which is coupled to an erbium-doped amplifier 40. The distributed Raman amplifier 20 includes a Raman pump module containing at least one Raman pump source 22. The Raman pump module introduces light into the optical fiber 24 to achieve Raman amplification. As the examiner

apparently recognizes, Srikant does not disclose that the optical fiber 24 is connected to the transmission terminal. That is, Srikant does not disclose that the pump source provides pump energy to the optical fiber span nearest the land-based transmission terminal.

Dennis in FIG. 11 shows a transmission link 605 interconnecting transmitter unit 654 and receiver unit 664. The transmission link 605 is made up of multiple spans 601. Each span, in turn, includes segments I, II and III. The fiber in each segement has one or more different physical characteristics from the fibers of the other segments within the same span (see column 6, lines 16-25 of the patent). In particular, segment III is designed to provide gain medium for amplification of the optical signal (see column 6, lines 57-62 of the patent). The gain may be provided by distributed Raman amplification. In particular, Raman amplification is achieved in segment III of span 601 by using a pump source 604 to provide a Raman pump signal 632 that counter-propagates the optical data signal 611. In addition, Raman amplification can also be achieved in segment III of span 601 by using an auxiliary Raman pump source 602 is provided to be co-propagating with the optical (data) signal 611.

To the best of Applicants' understanding, the Examiner appears to be asserting that Dennis shows a portion of the optical fiber transmission path connected to the transmission terminal. Since claim 1 of the present invention requires that pump energy be supplied to this portion of the transmission path, the claim effectively requires that this portion of the transmission path serve as a gain medium. As discussed above, in Dennis segment III serves as the portion of span 601 that acts as a gain medium. However, segment III does not constitute a portion of the optical fiber transmission path connected to the transmission terminal, as required by claim 1. Rather, the portion of the optical fiber transmission path that is connected to the terminal (unlabeled in FIG. 11, but located directly above the reference numeral 611) does not receive Raman pump energy from the pump sources 602 or 604. Moreover, Sirkant also fails to show this claimed feature of the invention. That is, in Sirkant the optical fiber 24 is not disclosed as being connected to the transmission terminal. Accordingly, since neither of Sirkant or Dennis show this

claimed feature, the combination of Sirkant and Dennis also fails to show or suggest this claimed feature.

Moreover, even assuming arguendo that this claimed feature missing from both Sirkant and Dennis were to be found in one of the references, Applicants respectfully submit that there is nevertheless no motivation to combine the references. In support of the proposed combination, the examiner states that "It would have been obvious to one of ordinary skill in the art ... to couple the Raman amplifier to a transmitter for the advantage of building an optical communication system." (Page 3, lines 1-3 of the Action). Applicants respectfully submit that this statement is at most a conclusion, and not an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification, as required by MPEP 706.02(j). In particular, the statement fails to address why it would be advantageous to combine the references in the manner suggested to build an optical communication system. Additionally, what is the advantage achieved? And where in the references is there a suggestion that this advantage can be achieved by making the modification proposed by the Examiner? The Examiner's statement fails to address each of these issues.

Finally, the Examiner apparently recognizes that neither Sirkant and Dennis discloses the step of increasing the Raman gain supplied to the optical signal in response to an increase in optical loss due to a cable repair. The Examiner asserts, however, that the admitted prior art teaches cable repair inherently increases optical loss (paragraph 7 of Applicant's specification) and that optical amplifiers provide amplification to optical signals to overcome optical loss (paragraph 3 of Applicants' specification). The Examiner then concludes that it would have been obvious to one of ordinary skill to increase the gain of an optical amplifier to overcome the increase in optical loss due to a cable repair.

While the statements addressing the admitted prior art are each individually accurate, Applicants' submit that the Examiner is ignoring additional prior art discussed in the specification in reaching an erroneous conclusion that in fact is based on hindsight. In particular, paragraph 7 of Applicants' specification states that "Undersea optical

transmission systems must typically allow for the possibility that over the system lifetime 1 cable repair will be necessary for every 20 km of transmission fiber located in shallow water. Moreover, each repair is expected to cause an increased optical loss of about 0.4 dB per repair. Accordingly, in a conventional undersea transmission system that exclusively employs EDFAs, about 1.2 dB of loss can be expected for a transmission span 70 km in length. The specification further states in paragraph 8 that "While a 1.2 dB loss may be effectively overcome by the self-healing nature of the EDFAs, a loss in the range of 2.4 dB may be too great to overcome in this manner while maintaining adequate signal fidelity."

Taken together, the Background of Applicants' specification makes clear that optical loss arising from repairs is conventionally addressed by ensuring that there is a sufficient loss budget that can be managed by the self-healing nature of the EDFAs. Thus, the prior art in fact does not increase the gain of an optical amplifier to overcome the increase in optical loss due to a cable repair. Rather, this technique to overcome loss arising from cable repairs only becomes realistic given Applicant's invention in which a Raman amplifier is combined with the EDFAs in the manner set forth in the claims. Only with the use of Raman amplification can the gain be readily increased to overcome the optical loss. Thus, the conclusion that the Examiner draws is directly based on Applicants' own teachings, which is clearly an impermissible use of hindsight.

Since none of the cited references, alone or in combination, show or suggest this claimed feature of the invention, it is respectfully requested that for at least this reason the rejection of independent claim 1 and the claims that depend therefrom under 35 U.S.C. 103(a) be reconsidered and withdrawn. The remaining independent claims, and the claims that depend therefrom, are also believed to be allowable for the same reasons presented above in connection with claim 1.

Conclusion

In view of the foregoing, it is believed that the application is now in condition for allowance and early passage of this case to issue is respectfully requested. If the

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Examiner believes there are still unresolved issues, a telephone call to the undersigned would be welcomed.

Fees

If there are any fees due and owing in respect to this amendment, the Examiner is authorized to charge such fees to deposit account number 50-1047.

Respectfully submitted,

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I hereby certify that this correspondence and any document referenced herein is being sent to the United States Patent and Trademark office via Facsimile to: 571-273-8300 on 3/22/06.

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